

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 18295 WO	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/ FI 00/ 00708	International filing date (day/month/year) 21/08/2000	(Earliest) Priority Date (day/month/year) 31/08/1999
Applicant NOKIA CORPORATION et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

3
☐ None of the figures.

INTERNATIONAL SEARCH REPORT

Internat Application No

PCT/FI 00/00708

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04Q7/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	WO 00 39666 A (SPYGLASS INC) 6 July 2000 (2000-07-06) page 8 -page 10; figure 1 abstract ---	1-11
X	"Wireless Application Protocol Architecture Specification" WAP ARCHITECTURE; VERSION 30-APR-1998, pages 1-20, XP002901466 abstract ---	1-11
A,P	METTER M ET AL: "WAP enabling existing HRML applications" IEEE; USER INTERFACE CONF 2000, 3 February 2000 (2000-02-03), pages 49-57, XP002901467 page 49, column 1 -page 50, column 2 abstract -----	1-11

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

14 December 2000

Date of mailing of the international search report

17. 04. 2001

Name and mailing address of the ISA

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Thomas Tholin

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/FI 00/00708

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 0039666 A	06-07-2000	DE 19962192 A	06-07-2000
		FI 992746 A	28-06-2000
		GB 2347329 A	30-08-2000
		JP 2000194612 A	14-07-2000
		SE 9904687 A	29-06-2000



REC'D 22 NOV 2001

WIPO

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 18295 WO	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/FI00/00708	International filing date (day/month/year) 21/08/2000	Priority date (day/month/year) 31/08/1999
International Patent Classification (IPC) or national classification and IPC H04Q7/00		
Applicant NOKIA CORPORATION et al.		
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 7 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 6 sheets.</p>		
<p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the report</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p>IV <input type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input checked="" type="checkbox"/> Certain documents cited</p> <p>VII <input type="checkbox"/> Certain defects in the international application</p> <p>VIII <input checked="" type="checkbox"/> Certain observations on the international application</p>		
Date of submission of the demand 23/03/2001	Date of completion of this report 20.11.2001	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Oteo Mayayo, C Telephone No. +49 89 2399 7563 	

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/FI00/00708

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1,2,5,6,8-11	as originally filed		
3,4,7	as received on	19/10/2001	with letter of 18/10/2001

Claims, No.:

1-11	as received on	19/10/2001	with letter of 18/10/2001
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Drawings, sheets:

1/3-3/3	as originally filed
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2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/FI00/00708

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-11
	No:	Claims	
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-11
Industrial applicability (IA)	Yes:	Claims	1-11
	No:	Claims	

2. Citations and explanations
see separate sheet

VI. Certain documents cited

1. Certain published documents (Rule 70.10)

and / or

2. Non-written disclosures (Rule 70.9)

see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

1. Concerning Item I

Basis of the opinion

D1: 'Wireless Application Protocol Architecture Specification' WAP
ARCHITECTURE; VERSION 30-APR-1998, pages 1-20, XP002901466

2. Concerning Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

2.1 The document D1 is regarded as being the closest prior art to the subject-matter of **claim 1**, this document shows the following features thereof (the references in parentheses applying to this document):

- (i) A method for filtering messages in a gateway (see D1, page 12, Figure 2: Gateway in the WAP Programming Model),
- (ii) which gateway receives and processes a first message that comes from a wireless terminal (see D1, page 12, Figure 2: Arrow named Encoded Request from Client to Gateway, in the WAP Programming Model) and
- (iii) which gateway retrieves a second message from an origin server (see D1, page 12, Figure 2: Response (Content) from Origin Server to Gateway, in the WAP Programming Model) and supplies it to the wireless terminal (see D1, page 12, Figure 2: Encoded Response Gateway to Client, in the WAP Programming Model), and
- (iv) said first and second messages belong to a specific message type of a set of message types known to the gateway (see D1, page 13, lines 12-14: "If the web server provides WAP content (e.g. WML)... However, if the web server provides WWW content (such as HTML)..."), characterised in that the method comprises:
- (v) determining for each message type known to the gateway, a filter chain that

determines the filters for filtering a message that belongs to respective message type (see D1, page 13, lines 12-14: "However, if the web server provides WWW content (such as HTML), a filter is used to translate the WWW content into WAP content. For example, the HTML filter would translate HTML into WML."), which filters have a specific order in the filter chain;

- (vi) receiving a message into the gateway (see D1, page 12, Figure 2: Arrow named Encoded Request from Client to Gateway, in the WAP Programming Model); determining the message type of the message arrived at the gateway (see D1, page 13, lines 12-14: "However, if the web server provides WWW content (such as HTML)..."); filtering said message in the filters defined for the message type of said message (see D1, page 13, lines 12-14: "However, if the web server provides WWW content (such as HTML), a filter is used to translate the WWW content into WAP content. For example, the HTML filter would translate HTML into WML.")

The subject-matter of claim 1 differs from D1 only in that in claim 1 a "filter chain with the filters in a specific order" is used, which is not explicitly disclosed in D1 (see D1, page 13, lines 12-14: "However, if the web server provides WWW content (such as HTML), a filter is used to translate the WWW content into WAP content. For example, the HTML filter would translate HTML into WML.").

However, in D1, page 12, Figure 2 and lines 29-30 ("Content Encoders and Decoders: The content encoders translate WAP content into compact encoded formats to reduce the size of data over the network"), a combination of encoders and decoders is used, which would prompt the person skilled in the art to combine several filters (forming a filter chain), if necessary, without implying any inventive activity.

Thus, the subject-matter of **claim 1** lacks an inventive step and does not meet the requirements of Article 33(3) PCT.

2.2 Independent **claim 10** (a gateway) as well as independent **claim 11** (a computer

program product), insofar as these claims can be understood (see Section VIII), contain in terms of apparatus features all the features of claim 1, therefore, the subject-matter of claims 10 and 11 does not involve an inventive step in the sense of Article 33(3) PCT (see point above).

- 2.3 Dependent **claims 2 to 9** do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step in the sense of Article 33(3) PCT.
- 2.4 The present invention is **susceptible of industrial application**, Article 33 (4) PCT.

3. Concerning Item VI

Certain documents cited

Certain published documents (Rule 70.10)

Application No Patent No	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
WO 00 39666	06.07.2000	28.12.1999	28.12.1998

Although this document (WO 00/39666) is not prior art according to Rule 64.1(a) PCT, it should be noticed that it discloses subject-matter which is considered to be relevant in respect of what is claimed in the present application.

4. Concerning Item VIII

Certain observations on the international application

The application does not meet the requirements of Article 6 PCT for the following reason:

Independent **claims 10 and 11** are unclear because the claims are referring to the result to be achieved ("means for determining a filter chain for each message type,

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/FI00/00708

which filter chain is arranged to filter the message..." and "a computer program code for determining the filter chain for each message type, which filter is arranged to filter a message", in claims 10 and 11, respectively), but it is not disclosed how to arrive at that result and, therefore, the skilled person would not know how to choose the appropriate way of implementing said apparatus and said computer program product.

that is unnecessary from the viewpoint of the wireless WAP terminal is typically removed from the content. This filtering of the content preferably takes place in the WAP gateway. In the WWW (World Wide Web, Internet), on the basis of which the WAP system was built, the processing of the content typically takes place at the end of the network browser, if any processing is required at all. In the WAP system, the processing of the content in the WAP browser of a wireless terminal is not possible in practice due to the limited storage space. And because there is a shortage of frequency bands used for data transfer in a wireless network, sending unnecessary information on to the radio path would not indeed be sensible.

Therefore, a flexible and efficient solution is needed for filtering each different content type in the WAP gateway. Different content types are, e.g. WML pages. WML-Script, MIME Multipart (Multipurpose Internet Mail Extensions), HTML pages and Error pages, as well as other content types defined in the WAP specifications.

The solution must be flexible, because it must be possible to add new filters to the WAP gateway, always when new content types appear. The solution must be efficient, because the data transfer capacity of the radio path is limited and because all the numerous requests that come from WAP terminals go through the WAP gateway.

It is possible to use for filtering a filtering mechanism, where all filtering stages are embedded in a single filter. However, this would reduce the flexibility of the system. For example, replacing the WML encoder used at the filtering stage of a WML page with a more efficient encoder would demand significant changes to be made in the system.

Now, a flexible and efficient solution has been invented for filtering a WAP content. There is provided a method for filtering messages in a gateway, which gateway receives and processes a first message that comes from a wireless terminal and which gateway retrieves a second message from an origin server and supplies it to the wireless terminal, and said first and second messages belong to a specific message type of a set of message types known to the gateway. It is characteristic of the method that it comprises:

determining for each message type known to the gateway, a filter chain that determines the filters for filtering a message that belongs to respective message type, which filters have a specific order in the filter chain;

receiving a message into the gateway;

- 5 determining the message type of the message that arrived at the gateway;
filtering said message in the filters of the filter chain, which filter chain is defined for the message type of said message, in the order that is determined in the filter chain in question.

- 10 According to the invention there is provided a gateway which gateway comprises a specific set of filters of which each filter is arranged to carry out specific filtering for filtering messages in the gateway;

means for receiving and processing a first message that comes from a wireless terminal;

- 15 means for retrieving a second message from an origin server and for supplying it to the wireless terminal;
and which said first and second messages belong to a specific message type of a set of message types known to the gateway. It is characteristic of the gateway that it comprises:

- 20 means for determining the message type of the message that comes to the gateway;

means for determining a filter chain for each message type, which filter chain is arranged to filter the message by directing it, in a specific order, through specific filters in the filter chain, depending on the message type.

25

According to the invention there is provided a computer program product that can be executed by means of a computer, for filtering messages in a gateway according to the invention, which computer program product comprises:

a computer program code for implementing a specific set of filters, of

- 30 which each filter is arranged to carry out a specific filtration, for filtering messages in a gateway;

a computer program code for receiving and processing a first message that comes from a wireless terminal;

- 35 a computer program code for retrieving a second message from an origin server and for supplying it to the wireless terminal;

- When the message that comprises the desired WAP content arrives from the origin server 23 to the gateway, the request handling unit 21 directs the content and headers relating thereto to a response filter façade in a response filtering unit
- 5 24. The response filtering unit 24 carries out the filtering of the content and the headers relating thereto for the radio path. In the gateway, there is a set of filter chains defined for the response filtering unit 24, one for each content type. The filter chain to be used for filtering is selected on the basis of the content type. Each filter of the filter chain performs in turn for the request a specific task that is
- 10 typically related to the filtering of the content for the radio path. The filtered content with its headers is returned to the request handling unit 21, which uses the COMM interface 20 for returning the response to the WAP protocol stack 25 from which the response will be forwarded along the radio path, to a WAP terminal.
- 15 In order to better bring out the basic idea of the invention, the response filtering unit 24 is shown in more detail in Figure 3. It illustrates a filter chain 31 – 35 that is used for the filtering of a WAP content, which WAP content in this explanatory case is a WML page, i.e. in this explanatory case, the content type is WML.
- 20 When the desired WAP content (WML page) with its headers arrives from the origin server 23 to the gateway, the request handling unit 21 consequently directs it and the headers relating thereto to a response filter façade 30 in the response filtering unit 24. The response filter façade 30 now studies from the headers sent with the WAP content, what the content type; message type, of the content is.
- 25 This is done by studying the content type field of a header. When the content type is WML, the content type field typically reads "text/x-wap.wml". From this, the response filter façade 30 concludes that the content is a WML page and makes it go through the filter chain 31 – 35, defined for the WML content type.
- 30 Filter chains are defined in a configuration file of the gateway, wherein symbolic names are used for the filters. The filter chain WML_Chain, defined for the WML content type, preferably comprises the following filters: UAProf 31 (User Agent Profile); WML_Encoder 32; Range_Filter 33; Header_Filter 34; Header_Encoder 35. In addition to this, the filter chain WML_Chain may also include other filters.
- 35 Each filter 31 – 35 of the filter chain performs in turn, in sequence, some simple task in the filtering of the content.

Claims

1. A method for filtering messages in a gateway (11), which gateway receives and processes a first message that comes from a wireless terminal (10) and which gateway retrieves a second message from an origin server (12, 23) and supplies it to the wireless terminal, and said first and second messages belong to a specific message type of a set of message types known to the gateway, **characterised** in that the method comprises:
 - determining for each message type known to the gateway, a filter chain (31 – 35) that determines the filters for filtering a message that belongs to respective message type, which filters have a specific order in the filter chain; receiving a message into the gateway (11); determining the message type of the message arrived at the gateway; filtering said message in the filters (31 – 35) of the filter chain that is defined for the message type of said message, in the order that is determined in the filter chain in question.
2. A method according to claim 1, **characterised** in that said gateway is a gateway of the WAP system (Wireless Application Protocol) and said wireless terminal is a WAP terminal.
3. A method according to claim 1, **characterised** in that said origin server is located in one of the following: Internet network; Intranet network.
4. A method according to claim 1, **characterised** in that said first message comprises a request for bringing the WAP content as a response to said first message from the origin server through the WAP gateway to the WAP terminal, and that said second message is the response in question, which comprises the requested WAP content.
5. A method according to claim 1, **characterised** in that the second message arrived at the gateway comprises the WAP content and a header as a response to the request comprised by said first message, whereupon the message type of the message is determined in the gateway by reading the message type in the content type field of the header.

6. A method according to claim 5, **characterised** in that only the header is filtered if the determined message type of said second message is unknown to the gateway.
- 5 7. A method according to claim 1, **characterised** in that said message type of the first message is one of the following: WSP request (Wireless Session Protocol); push request.
- 10 8. A method according to claim 1, **characterised** in that said message type of the second message is one of the following: WML page; WML-script; MIME Multipart (Multipurpose Internet Mail Extensions); HTML page; Error page.
- 15 9. A method according to claim 1, **characterised** in that for each message type a filter chain is defined in a configuration file of the gateway.
- 20 10. A gateway (11), which comprises
a specific set of filters (31 – 35) of which each filter is arranged to carry out a specific filtration, for filtering messages in the gateway (11);
means (20 – 22, 25) for receiving and processing a first message that comes from a wireless terminal (10);
means (20, 21, 25) for retrieving a second message from an origin server (12, 23) and for supplying it to the wireless terminal (10),
and which said first and second messages belong to a specific message type of a set of message types known to the gateway, **characterised** in that the gateway (11) comprises:
25 means (30) for determining the message type of the message that comes to the gateway (11);
means (30) for determining a filter chain (31 – 35) for each message type, which filter chain is arranged to filter the message by directing it, in a specific
30 order, through specific filters (31 – 35) in the filter chain, depending on the message type.
- 35 11. A computer program product that can be run by means of a computer for filtering messages in a gateway (11), which computer program product comprises:

a computer program code for implementing a specific set of filters (31 – 35) of which each filter is arranged to carry out a specific filtration, for filtering messages in the gateway (11);

5 a computer program code (20 – 22, 25) for receiving and processing a first message that comes from a wireless terminal (10);

10 a computer program code (20, 21, 25) for retrieving a second message from an origin server (12, 23) and for supplying it to the wireless terminal (10), and which said first and second messages belong to a specific message type of a set of message types known to the gateway, **characterised** in that the computer program product (11) comprises:

a computer program code (30) for determining the message type of the message that comes to the gateway (11);

15 a computer program code (30) for determining the filter chain (31 – 35) for each message type, which filter chain is arranged to filter a message by directing it in a specific order through specific filters (31 – 35) in the filter chain, depending on the message type.

PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

To:

JOHANSSON, Folke
Nokia Corporation
P.O. Box 206
FIN-00045 Nokia Group
FINLANDE

Date of mailing (day/month/year)

25 April 2001 (25.04.01)

Applicant's or agent's file reference

18295 WO

IMPORTANT NOTIFICATION

International application No.

PCT/FI00/00708

International filing date (day/month/year)

21 August 2000 (21.08.00)

1. The following indications appeared on record concerning:

☐

the applicant

☐

the inventor

☒

the agent

☐

the common representative

Name and Address

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2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐

the person

☐

the name

☒

the address

☐

the nationality

☐

the residence

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3. Further observations, if necessary:

4. A copy of this notification has been sent to:

☒

the receiving Office

☒

the designated Offices concerned

☒

the International Searching Authority

☐

the elected Offices concerned

☐

the International Preliminary Examining Authority

☐

other:

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(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
8 March 2001 (08.03.2001)

PCT

(10) International Publication Number
WO 01/17281 A2

(51) International Patent Classification⁷: **H04Q 7/00**

(21) International Application Number: **PCT/FI00/00708**

(22) International Filing Date: **21 August 2000 (21.08.2000)**

(25) Filing Language: **Finnish**

(26) Publication Language: **English**

(30) Priority Data:
19991845 31 August 1999 (31.08.1999) FI

(71) Applicant (for all designated States except US): **NOKIA CORPORATION [FI/FI]; Keilalahdentie 4, FIN-02150 Espoo (FI).**

(72) Inventor; and

(75) Inventor/Applicant (for US only): **RAUTIAINEN, Aapo [FI/FI]; Hyljelahdentie 19 as 16, FIN-02260 Espoo (FI).**

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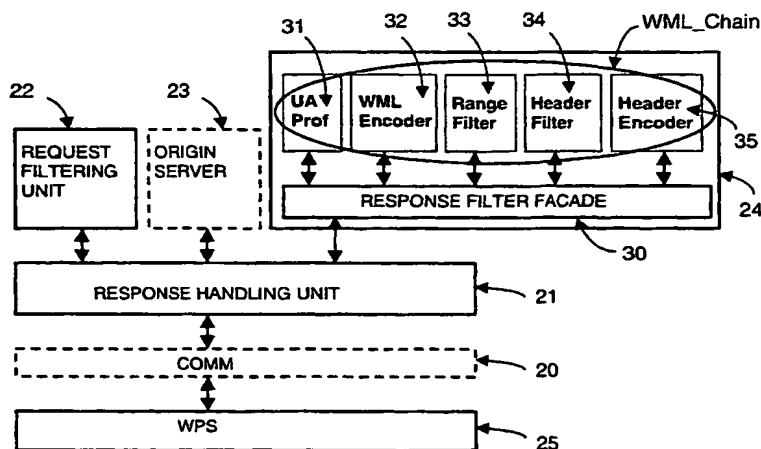
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(54) Title: **CONTENT FILTERING IN A GATEWAY OF A WIRELESS SYSTEM**



(57) Abstract: The object of the invention is a method for filtering messages in a gateway, which receives and processes a specific first message that comes from a wireless terminal, and which gateway retrieves a specific second message from an origin server and supplies it to the wireless terminal. Said first and second messages belong to a specific message type of a set of message types known to the gateway. In the method, a filter chain (WML_Chain) is determined for each message type known to the gateway, which filter chain determines filters (31 - 35) for filtering a message that belongs to respective message type. The filters (31 - 35) have, in the filter chain, a specific mutual order. Furthermore, in the method, a message is received into the gateway and the message type of the message that arrived at the gateway is determined. In addition, said message is filtered in the filters (31 - 35) of the filter chain that is defined for the message type of the said message, in the order determined in the filter chain in question. The object of the invention is also a gateway for filtering a content according to the method presented above, and a computer program product for implementing said gateway.

Content filtering in a gateway of a wireless system

The present invention relates to a gateway that connects a wireless network and the Internet network enabling the bringing of a content from the Internet network to a wireless terminal. The invention relates in particular to the filtering of a content in a gateway of the WAP system (Wireless Application Protocol).

Wireless communication networks and the Internet network are expanding rapidly and the number of their users is increasing. Bringing Internet contents and advanced data services to digital mobile stations, so-called media phones, is possible, e.g. with the help of WAP engineering or Smart Messaging engineering presented by Nokia. Although, hereinafter in this description, the WAP system will be used as an example, the explanation also relates to other similar systems (Nokia Smart Messaging, etc.) the duty of which is to bring Internet contents to wireless terminals. The contents brought to wireless terminals with the help of WAP engineering are called by the common noun of WAP content. WAP engineering utilises parts of the existing standards. Furthermore, it comprises own solutions optimised for wireless networks. The intention is to globally support as many wireless digital telecommunication networks as possible. Because the WAP system was developed only recently and because, in some cases, only frameworks for different implementations are defined in the WAP system specifications, there are no known solutions for the implementation of certain parts of the system.

The WAP system is based on the co-operation of three different components: a WAP terminal 10; a WAP gateway 11; and an origin server 12 (Figure 1). Respectively, the Nokia Smart Messaging system comprises a gateway, in between a terminal and an origin server, one product version of which is called Nokia Artus Messaging Platform. For browsing WAP contents, a user has the wireless WAP terminal 10, which comprises a WAP browser as the user interface, a so-called micro browser or some other WAP application that functions in a WAP terminal. As such, the WAP terminal 10 can be just any device that uses WAP protocol for external communication. The WAP browser is analogous with a web browser.

When the user wants to get a certain WAP content to his terminal, an efficiently encoded request 13 will go along the radio path first to the WAP gateway 11. The

WAP gateway that comprises means for encoding and decoding is capable of transforming information that is according to WAP protocol, e.g. Internet protocol, into information that is according to HTTP protocol (HyperText Transfer Protocol), and vice versa. After getting from the WAP terminal 10 the above-mentioned request, the gateway 11 transforms it into a request 14 that is according to Internet protocol and sends it to the origin server 12, wherein the desired WAP content is located.

The WAP content, obtained from the origin server 12 as a response 15 to the request can be, e.g. a WML (Wireless Markup Language) document or a WML-Script document, is sent to the WAP gateway 11, which transforms the information according to Internet protocol into information according to WAP protocol, e.g. WSP protocol. In a gateway of the Nokia Smart Messaging system, e.g. an HTML (Hyper Text Markup Language) document is respectively transformed, e.g. into a TTML (Tagged Text Markup Language) document. Further, the gateway 11 sends 16 the WAP content efficiently encoded for the radio path, to the user's WAP terminal 10.

It should be noted that typically, there are in between a WAP gateway and a radio interface, e.g. in the GSM (Global System for Mobile communication) network, a number of elements. Typically, these are devices that are located, e.g. in a mobile services switching centre, in a base station controller or a base transceiver station. The WAP gateway may physically be located, e.g. in a corporate data network. It is typically implemented by a computer program that can be run, e.g. in a Windows NT workstation. The WAP gateway can be connected, e.g. to a GSM network mobile services switching centre or short message service centre. Thus, the WAP gateway can be considered to be functionally in connection with the radio interface.

The limited data transfer capacity of a wireless network and the features of a wireless WAP terminal (e.g. mobile station, cellular radio network mobile phone), such as a small-sized display and limited storage space place restrictions on the WAP content to be retrieved from the Internet network to the WAP terminal. Typically, the WAP content to be retrieved to the WAP terminal from the Internet network is not, in this case, suitable as such for being viewed by a user but typically, the content must be processed on several different occasions before it is transferred over the air interface on to the radio path. In other words, information

that is unnecessary from the viewpoint of the wireless WAP terminal is typically removed from the content. This filtering of the content preferably takes place in the WAP gateway. In the WWW (World Wide Web, Internet), on the basis of which the WAP system was built, the processing of the content typically takes place at the end of the network browser, if any processing is required at all. In the WAP system, the processing of the content in the WAP browser of a wireless terminal is not possible in practice due to the limited storage space. And because there is a shortage of frequency bands used for data transfer in a wireless network, sending unnecessary information on to the radio path would not indeed be sensible.

Therefore, a flexible and efficient solution is needed for filtering each different content type in the WAP gateway. Different content types are, e.g. WML pages. WML-Script, MIME Multipart (Multipurpose Internet Mail Extensions), HTML pages and Error pages, as well as other content types defined in the WAP specifications.

The solution must be flexible, because it must be possible to add new filters to the WAP gateway, always when new content types appear. The solution must be efficient, because the data transfer capacity of the radio path is limited and because all the numerous requests that come from WAP terminals go through the WAP gateway.

It is possible to use for filtering a filtering mechanism, where all filtering stages are embedded in a single filter. However, this would reduce the flexibility of the system. For example, replacing the WML encoder used at the filtering stage of a WML page with a more efficient encoder would demand significant changes to be made in the system.

Now, a flexible and efficient solution has been invented for filtering a WAP content. There is provided a method for filtering messages in a gateway, which gateway receives and processes a first message that comes from a wireless terminal and which gateway retrieves a specific second message from an origin server and supplies it to the wireless terminal, and said first and second messages belong to a specific message type of a set of message types known to the gateway. It is characteristic of the method that it comprises:

determining for each message type known to the gateway, a filter chain that determines the filters for filtering a message that belongs to respective message type, which filters have a specific mutual order in the filter chain;

receiving a message into the gateway;

5 determining the message type of the message that arrived at the gateway;

filtering said message in the filters of the filter chain, which filter chain is defined for the message type of said message, in the order that is determined in the filter chain in question.

10 According to the invention there is provided a gateway which gateway comprises a specific set of filters of which each filter is arranged to carry out specific filtering for filtering messages in the gateway;

means for receiving and processing a specific first message that comes from a wireless terminal;

15 means for retrieving a specific second message from an origin server and for supplying it to the wireless terminal;

and which said first and second messages belong to a specific message type of a set of message types known to the gateway. It is characteristic of the gateway that it comprises:

20 means for determining the message type of the message that comes to the gateway;

means for determining a filter chain for each message type, which filter chain is arranged to filter the message by directing it, in a specific order, through specific filters in the filter chain, depending on the message type.

25 According to the invention there is provided a computer program product that can be executed by means of a computer, for filtering messages in a gateway according to the invention, which computer program product comprises:

30 a computer program code for implementing a specific set of filters, of which each filter is arranged to carry out a specific filtration, for filtering messages in a gateway;

a computer program code for receiving and processing a specific first message that comes from a wireless terminal;

35 a computer program code for retrieving a specific second message from an origin server and for supplying it to the wireless terminal;

and which said first and second messages belong to a specific message type of a set of message types known to the gateway. It is characteristic of the computer program product that it comprises:

- 5 a computer program code for determining the message type of the message that comes to the gateway;
 - a computer program code for determining a filter chain for each message type, which filter chain is arranged to filter the message by directing it, in a specific order, through specific filters in the filter chain, depending on the message type.
- 10 According to the invention, a filtering mechanism based on a filter chain is used in a WAP gateway. Several different filter chains are defined for the WAP gateway, one for each content type. A content with the headers that arrives from the Internet network to the WAP gateway is filtered in a filter chain defined for the content type in question. Each filter of the filter chain performs in turn a specific
- 15 task for the content, where the content and/or the headers that come along with it are edited to make them suitable for the transfer to a wireless WAP terminal, carried out along the radio path.

20 In the following, the invention will be explained in detail by referring to the enclosed drawings, in which

- Figure 1 shows a model of the WAP system;
- 25 Figure 2 shows parts of a WAP gateway that are related to the processing of requests that arrive from WAP terminals;
- Figure 3 shows a preferred embodiment of filtering a WAP content according to the invention;
- 30 Figure 4 is a flow diagram that shows a decision-making process in a response filtering unit according to the invention; and
- Figure 5 illustrates the positioning of individual filters in different filter chains according to the invention.

Figure 1 was explained above in connection with the explanation of prior art. Figure 2 shows parts of a WAP gateway that are related to the processing of requests that come from WAP terminals along the radio path. The request mentioned here can be, for example, a request for retrieving some WAP content, e.g. a WML document that contains railway guide information, from an origin server in the Internet network, to a WAP terminal.

COMM 20 (Communication interface) is in a WAP gateway an interface over which messages, e.g. a request according to WSP protocol or a so-called push request that have come from WAP terminals to a WAP protocol stack 25 of the gateway, are transferred from the protocol stack to a request handling unit 21. The gateway's WAP protocol stack (WPS) 25 comprises protocols for communication between the gateway and a WAP terminal. These are not shown in the figure.

The request handling unit 21 is preferably a so-called run time unit. It is a computer program, which can be run alone but which alone performs nothing sensible. In other words, it needs around it other computer programs or parts of a computer program in order to operate sensibly, as will be presented next.

The decoding of a request that comes from a WAP terminal and its changing into a format that is understood by the gateway logic is carried out in a request filtering unit 22, which is hidden behind a request filter façade. The program logic checks what kind of request it is a question of, i.e. the message type of the request in question is checked. The filtering of the request comprises slightly different kinds of stages depending on whether the request is of the message type of, e.g. an ordinary WSP request or a push request. If it is a question of a normal WSP request, the request will go through the filter chain determined for a WSP request, if again it is a question of a push request, the request will go through the filter chain determined for a push request. Each filter of the filter chain performs in turn a specific task for the request, which may be related, e.g. to the decoding of the request. After the filtering of the request, the filtered request will be returned to the request handling unit 21.

Typically, the desired WAP content is retrieved from the Internet or Intranet: from an origin server 23, to a WAP gateway over a content source façade. This will take place as a result of a request made by the request handling unit 21 to the content source façade.

- When the message that comprises the desired WAP content arrives from the origin server 23 to the gateway, the request handling unit 21 directs the content and headers relating thereto to a response filter façade in a response filtering unit
- 5 24. The response filtering unit 24 carries out the filtering of the content and the headers relating thereto for the radio path. In the gateway, there is a set of filter chains defined for the response filtering unit 24, one for each content type. The filter chain to be used for filtering is selected on the basis of the content type. Each filter of the filter chain performs in turn for the request a specific task that is
- 10 typically related to the filtering of the content for the radio path. The filtered content with its headers is returned to the request handling unit 21, which uses the COMM interface 20 for returning the response to the WAP protocol stack 25 from which the response will be forwarded along the radio path, to a WAP terminal.
- 15 In order to better bring out the basic idea of the invention, the response filtering unit 24 is shown in more detail in Figure 3. It illustrates a filter chain 31 – 35 that is used for the filtering of a WAP content, which WAP content in this explanatory case is a WML page, i.e. in this explanatory case, the content type is WML.
- 20 When the desired WAP content (WML page) with its headers arrives from the origin server 23 to the gateway, the request handling unit 21 consequently directs it and the headers relating thereto to a request filter façade 30 in the response filtering unit 24. The response filter façade 30 now studies from the headers sent with the WAP content, what the content type; message type, of the content is.
- 25 This is done by studying the content type field of a header. When the content type is WML, the content type field typically reads "text/x-wap.wml". From this, the response filter façade 30 concludes that the content is a WML page and makes it go through the filter chain 31 – 35, defined for the WML content type.
- 30 Filter chains are defined in a configuration file of the gateway, wherein symbolic names are used for the filters. The filter chain WML_Chain, defined for the WML content type, preferably comprises the following filters: UAProf 31 (User Agent Profile); WML_Encoder 32; Range_Filter 33; Header_Filter 34; Header_Encoder 35. In addition to this, the filter chain WML_Chain may also include other filters.
- 35 Each filter 31 – 35 of the filter chain performs in turn, in sequence, some simple task in the filtering of the content.

In the example shown in Figure 3, the WML content with its headers is filtered first in the filter UAProf 31, which carries out for the content the changes required by the User Agent Profile of the WAP terminal that sent the request. Changes are needed because WAP browsers that function in different WAP terminals may, e.g.
5 support different WML versions (e.g. Version 1.0 or 1.1).

At the second stage, the WML content (WML page) is efficiently encoded for the radio path in the filter WML_Encoder 32. The encoding may take place, e.g. according to the specification; Binary XML Content Format Specification, defined
10 by the WAP Forum. The specification in question is part of the definition of the WAP protocol version 1.1.

If the WML page requested by a user's WAP terminal is so big that the data transfer protocol cannot transfer all the data in one go, the WAP terminal can
15 make a WAP request that corresponds to the range request of the HTTP protocol version 1.1. In this case, the WML page (and the related images, sounds, etc.) are sent to the WAP terminal in parts. For example, first the bytes 0 – 999 can be requested, then the bytes 1000 – 1999, and so on. The third filter, Range_Filter 33, selects from the page encoded by the WML_Encoder, the requested byte link.
20

In the fourth filter (Header_Filter 34) of the filter chain WML_Chain, certain headers that have accompanied the WML page and are unnecessary from the viewpoint of the WAP terminal, are removed. These are, among others, Connection headers defined in the HTTP protocol version 1.1. The headers are
25 attached to the WML page in the text format, wherefore their identification takes place by comparing them with the headers known to the gateway.

In the fifth filter (Header_Encoder 35) of the filter chain, the header of the WML page is efficiently encoded for the radio path, into a header according to WSP
30 protocol. Encoding is based on the WSP protocol version 1.1, defined by the WAP Forum. In encoding, headers that are in the text format are replaced by bytes defined in the WSP specification. After this, the WSP content with its headers is returned to the request handling unit 21. The filtered WAP content is sent through the radio path to a WAP terminal, e.g. to a mobile station. In the WAP browser of
35 the mobile station, the WAP content is displayed on a display. In the mobile station, the content does not have to be processed any more by filtering.

Similar filter chains are also defined for the response filtering unit as for the other content types. Also for the request filtering unit, filter chains are defined for a normal WAP request (WSP request) and a push request, in a similar manner.

- 5 One filter may belong to more than one chain. One and the same filter may also belong to filter chains used in both request filtering and response filtering. Each WAP content is only filtered in those filters that are necessary exactly for the content type in question.
- 10 The program code, the running of which in a computer will implement the functionality according to the invention, can be programmed, e.g. in some object programming language, preferably Java programming language.

Filter chains and the filters that belong thereto are defined in a configuration file.

- 15 Typically, the configuration file comprises rows, wherein the name of a filter chain and the filters that belong thereto, in the order of filtration, are determined by symbolic names. The row that determines the above-mentioned filter chain WML_Chain may look, for example, as follows:

20 WML_CHAIN=UAPROF:WML_ENCODER:RANGE_FILTER:HEADER_FILTER:HEADER_ENCODER;

- Here, WML_CHAIN is the symbolic name of the filter chain to be used for filtering the WML content. UAPROF is the symbolic name of the first filter to be
25 implemented, WML_ENCODER is the symbolic name of the second filter to be implemented and so on.

- The correspondence between the symbolic names and the actual Java classes is also defined in the configuration file. The Java classes are taken into use when
30 the WAP gateway is initiated, whereupon from the Java classes, objects; instances of the class, are created which in fact act as filters in the filter chain.

- Figure 4 is a flow diagram that illustrates a decision-making process according to the invention in the response filtering unit 24 of a WAP gateway. In the gateway,
35 the content types are classified as known and unknown types. Known content types are, among others, WML, WML-Script, MIME Multipart, HTML, and Error pages, as well as other content types defined in the WAP specifications. When

the desired WAP content with its headers arrives from an origin server to a gateway (block 41), a request handling unit directs it and the headers related thereto to a response filter façade in a response filtering unit. The response filter façade now determines from the headers sent with the WAP content, what the content's content type is (42). If the content type is known, a filter chain that is defined for the content type in question will be used for filtering the content (44). If again the content type is unknown to the WAP gateway, the WAP content is allowed to pass through a binary filter, which will not touch the content itself, but only filters the headers (45).

In both cases, the filtered content is directed to the WAP protocol stack of the gateway and from there further to the WAP browser of a user's wireless WAP terminal, with the help of normal WAP routines (block 46).

A filtering mechanism based on a filter chain provides for filters to be easily concatenated and, therefore, supports the upgrading of the different components. If a new content type appears it is easy to define, in the configuration file, a filter chain for the new content type, which it will go through. The filter chain concept also provides an efficient way to filter a WAP content, because each WAP content only goes through those filters that are necessary exactly for the content type in question.

Figure 5 illustrates the positioning of individual filters in different filter chains, in an imaginary case. Let us assume that a gateway comprises a program code, wherein filters AA, BB, CC, DD, EE, FF and GG are implemented. Let us further assume that the gateway knows three different content types for contents than arrive from the Internet (response) for the filtering of which filter chains K, L and M are used. In addition, the gateway knows two request types for requests that come from a WAP terminal, for the filtering of which filter chains P and R are used. The system administrator determines the filters to be used in the filter chains in question. In the case shown in Figure 5, of the filter chains used for filtering the response, K comprises, in sequence, the filters AA, BB, CC and DD; the filter chain L comprises the filters AA, CC and GG; and the filter chain M comprises the filters AA, CC, EE, FF and GG. Of the filter chains used for filtering the requests that come for the WAP terminal, P comprises, in sequence, the filters AA, BB, CC and FF; and R comprises the filters BB and CC. In this way, it is possible to

flexibly form five sensible filter chains with seven filters, implemented by the system.

5 A gateway according to the invention can be implemented programmably. The computer program product in question can be stored in a data medium, e.g. a memory, it can be transferred, and it can be run in a computer.

10 This paper presents the implementation and embodiments of the invention with the help of examples. A person skilled in the art will appreciate that the present invention is not restricted to details of the embodiments presented above and that the invention can also be implemented in another form without deviating from the characteristics of the invention. The presented embodiments should be regarded as illustrative but not restricting. Thus, the possibilities of implementing and using the invention are only restricted by the enclosed claims, and the various options of
15 implementing the invention as determined by the claims, including the equivalent implementations, also belong to the scope of the invention.

Claims

1. A method for filtering messages in a gateway, which gateway receives and processes a specific first message that comes from a wireless terminal and
5 which gateway retrieves a specific second message from an origin server and supplies it to the wireless terminal, and said first and second messages belong to a specific message type of a set of message types known to the gateway, **characterised** in that the method comprises:
determining for each message type known to the gateway, a filter chain
10 that determines the filters for filtering a message that belongs to respective message type, which filters have a specific mutual order in the filter chain;
receiving a message into the gateway;
determining the message type of the message arrived at the gateway;
filtering said message in the filters of the filter chain that is defined for the
15 message type of said message, in the order that is determined in the filter chain in question.
2. A method according to claim 1, **characterised** in that said gateway is a
gateway of the WAP system (Wireless Application Protocol) and said wireless
20 terminal is a WAP terminal.
3. A method according to claim 1, **characterised** in that said origin server is located in one of the following: Internet network; Intranet network.
- 25 4. A method according to claim 1, **characterised** in that said first message comprises a request for bringing the WAP content as a response to said first message from the origin server through the WAP gateway to the WAP terminal, and that said second message is the response in question, which comprises the requested WAP content.
30
5. A method according to claim 1, **characterised** in that the second message arrived at the gateway comprises the WAP content and a header as a response to the request comprised by said first message, whereupon the message type of the message is determined in the gateway by reading the
35 message type in the content type field of the header.

6. A method according to claim 5, **characterised** in that only the header is filtered if the determined message type of said second message is unknown to the gateway.
- 5 7. A method according to claim 1, **characterised** in that said message type of the first message is one of the following: WSP request (Wireless Session Protocol); push request.
- 10 8. A method according to claim 1, **characterised** in that said message type of the second message is one of the following: WML page; WML-script; MIME Multipart (Multipurpose Internet Mail Extensions); HTML page; Error page.
- 15 9. A method according to claim 1, **characterised** in that for each message type a filter chain is defined in a configuration file of the gateway.
- 20 10. A gateway (11), which comprises
a specific set of filters (31 – 35) of which each filter is arranged to carry out a specific filtration, for filtering messages in the gateway (11);
means (20 – 22, 25) for receiving and processing a specific first message that comes from a wireless terminal (10);
means (20, 21, 25) for retrieving a specific second message from an origin server (12, 23) and for supplying it to the wireless terminal (10),
and which said first and second messages belong to a specific message type of a set of message types known to the gateway, **characterised** in that the gateway (11) comprises:
means (30) for determining the message type of the message that comes to the gateway (11);
means (30) for determining a filter chain (31 – 35) for each message type, which filter chain is arranged to filter the message by directing it, in a specific order, through specific filters (31 – 35) in the filter chain, depending on the message type.
- 25 30 35 11. A computer program product that can be run by means of a computer for filtering messages in a gateway (11), which computer program product comprises:

a computer program code for implementing a specific set of filters (31 – 35) of which each filter is arranged to carry out a specific filtration, for filtering messages in the gateway (11);

5 a computer program code (20 – 22, 25) for receiving and processing a specific first message that comes from a wireless terminal (10);

a computer program code (20, 21, 25) for retrieving a specific second message from an origin server (12, 23) and for supplying it to the wireless terminal (10),

10 and which said first and second messages belong to a specific message type of a set of message types known to the gateway, **characterised** in that the computer program product (11) comprises:

a computer program code (30) for determining the message type of the message that comes to the gateway (11);

15 a computer program code (30) for determining the filter chain (31 – 35) for each message type, which filter chain is arranged to filter a message by directing it in a specific order through specific filters (31 – 35) in the filter chain, depending on the message type.

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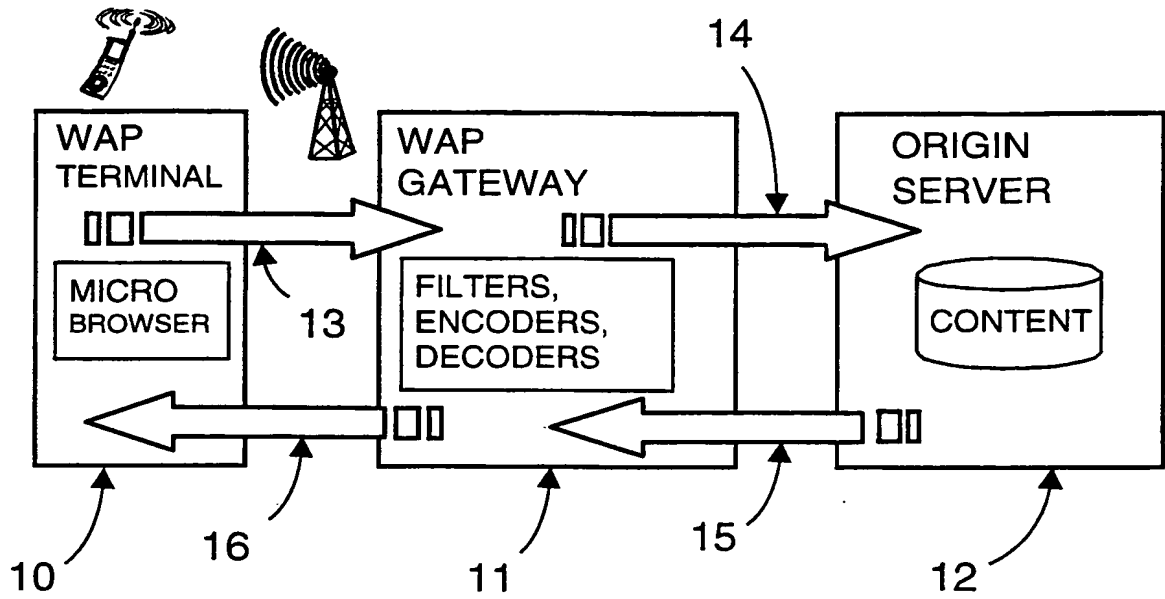


Fig. 1

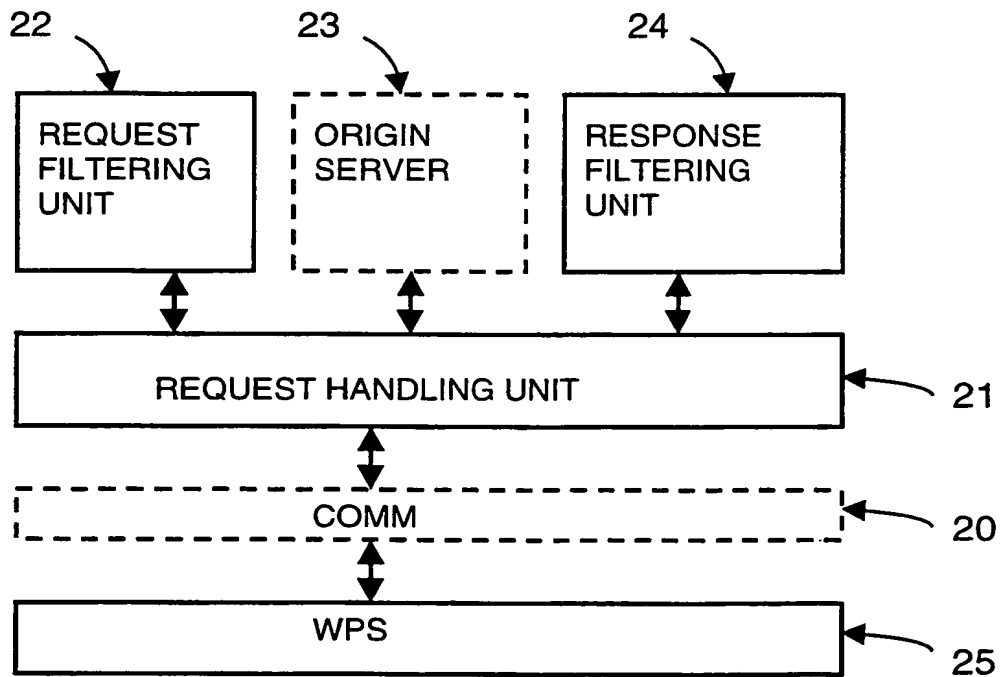


Fig. 2

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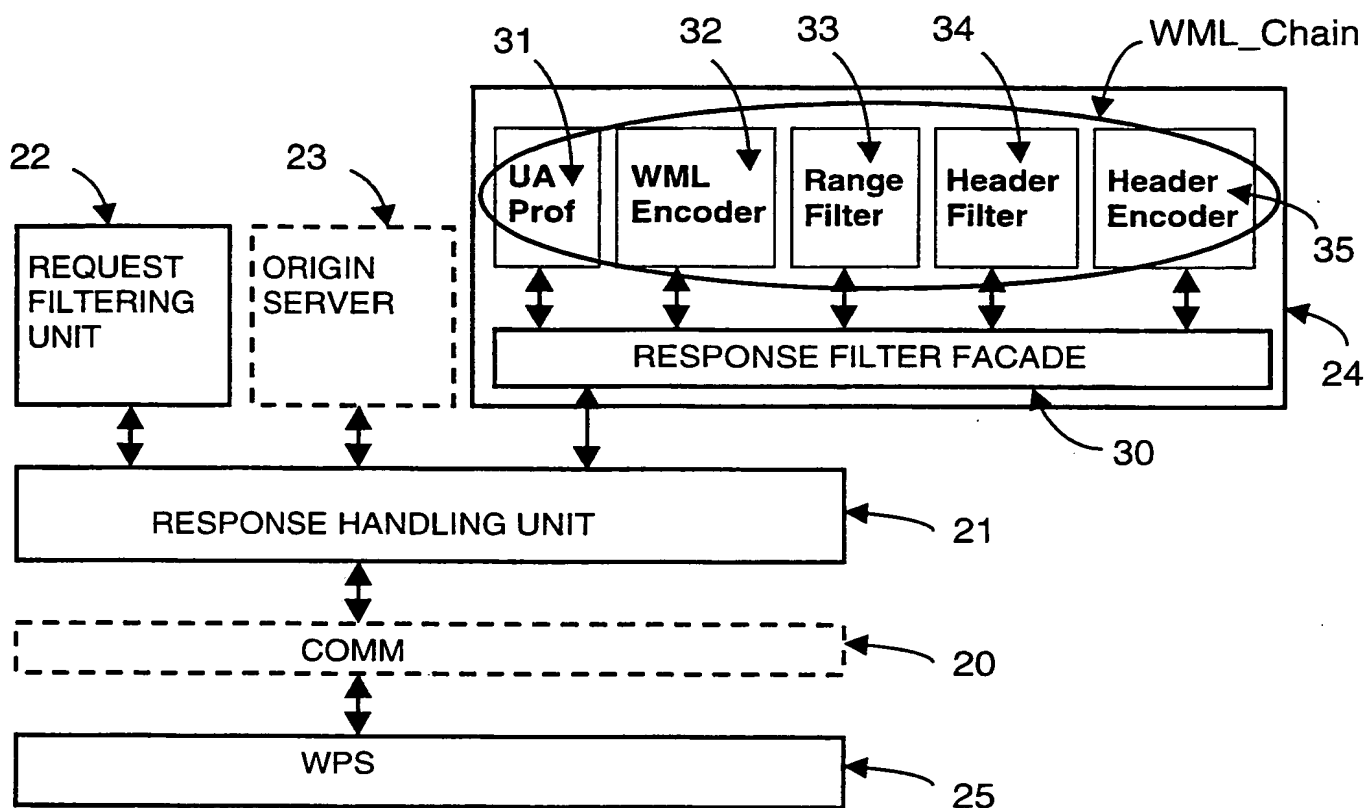


Fig. 3

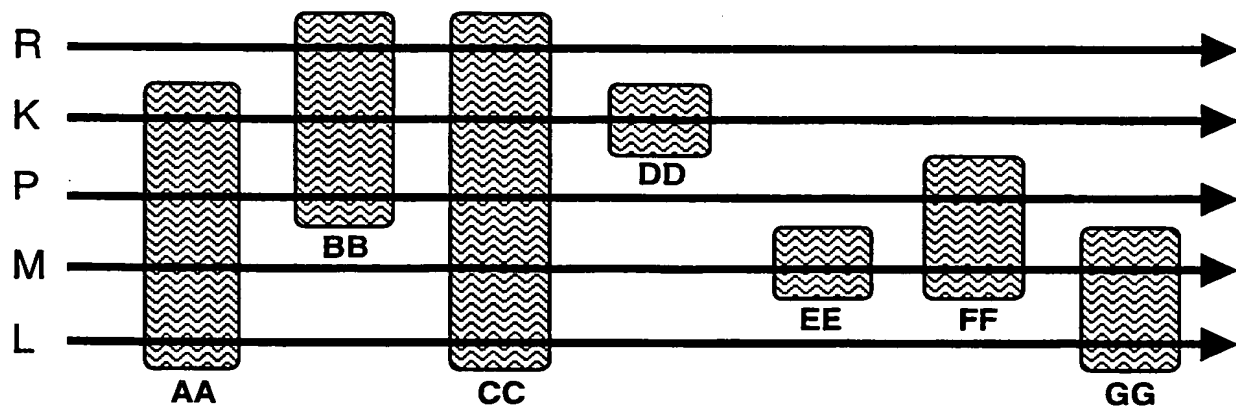


Fig. 5

3/3

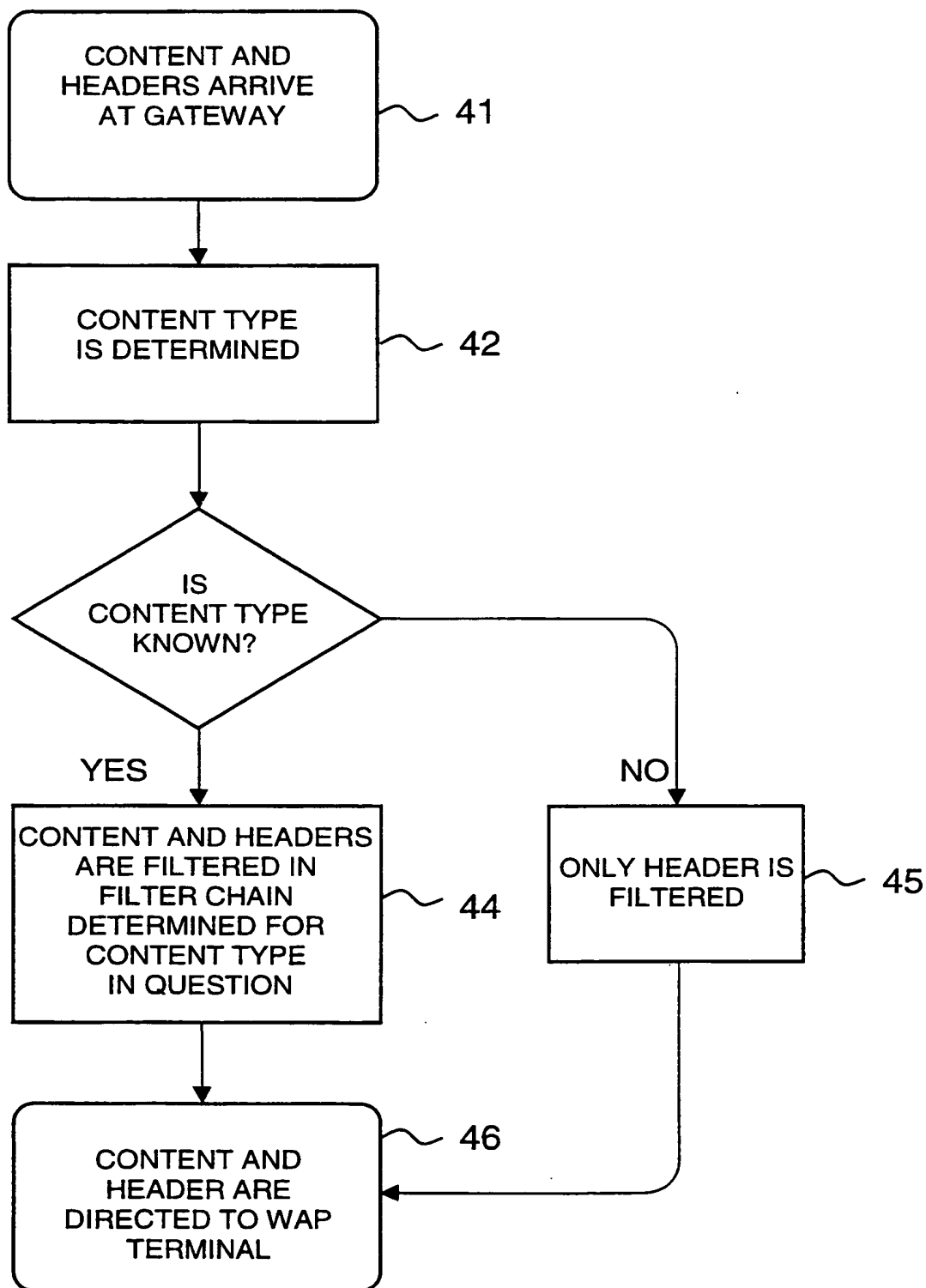


Fig. 4